



Fact Sheet

California Environmental Protection Agency



Air Resources Board

Electric Vehicles and Energy Use

Frequently Asked Questions

How much electricity does an electric car use to recharge its batteries?

EVs use, on average, a little less than half a kilowatt-hour per mile as they drive. This is analogous to miles per gallon of gasoline used. So, just as a gasoline car needs about 12 gallons of gas to refill the tank when the car has been driven 300 miles, an electric vehicle needs about 40 kilowatt-hours to fully recharge after being driven 60 to 80 miles.

However, the way EVs are recharged is different from the way gasoline cars are refueled. Where a gas car is usually refueled when the tank is empty, typically, EVs are charged each night. And Californian's, on average, drive about 30 miles per day. So, a more typical estimate of the amount of electricity used daily by an EV would be more like 15 kilowatt-hours.

How much does it cost to charge an EV?

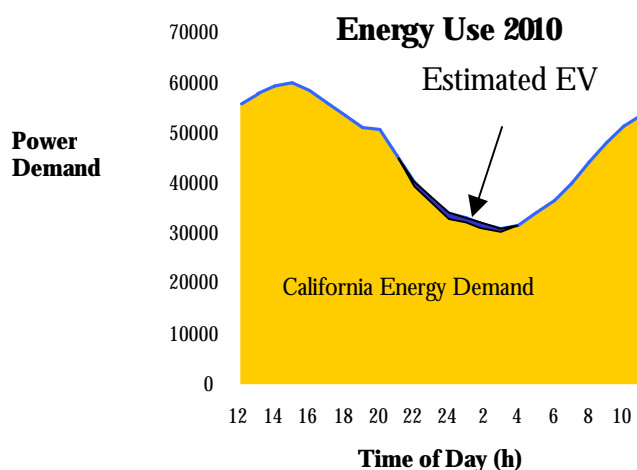
Electric vehicles are often charged at home using a separate electricity meter. Electric utilities have offered special rates to EV customers who take advantage of "time-of-use" metering so that they only charge their car at night. This helps the utilities by shifting the demand for electricity needed for EVs to the period when overall demand is at its lowest. The rates offered using these time-of-use meters has been as low as \$0.05 per kilowatt-hour. So, charging an EV would cost approximately a dollar a day.

How much electrical power would all the EVs in California need in order to recharge at the same time and how does that compare to California's demand for power?

Between 4,500 and 10,000 EVs are estimated to be added to California's roads each year starting in 2003. If all of these EVs plugged in at the same time to recharge they would need 50 megawatts of power to recharge. This represents less than 0.06 percent of California's total power demand.

Don't EV's contribute to the peak energy demand needs in the state?

As mentioned above, most EVs are recharged at night when demand for electrical power is at its minimum. Consumer surveys and utility observations note that as many as 95 percent of the State's current EV drivers charge at night while at home, taking advantage of the excess capacity. This excess capacity is significant – as much as 50 percent of the total system's capacity. If this charging behavior continues, the minor ZEV demand stated above would not add any need for increased capacity to the state's electricity system and would in fact be beneficial. The graph below illustrates the anticipated power demand relative to California's total demand for electricity in 2010, when we have 50 times more EVs than we have today.



Aren't more EVs in the future just going to increase California's energy problems?

As described above, EVs taking advantage of off-peak electricity generation capacity can actually help California's electrical system. In the future, EVs may be able to play an even greater role in assisting the electrical grid. Many organizations, including automakers and electric utilities as well as the ARB are investigating the feasibility of using electric-drive vehicles as distributed sources of electric power for the California electric grid. This works by using the EV's battery pack as energy storage that can be fed back into the electricity grid at times of peak demand. For example, an EV parked and hooked to a charger during the day could feed electricity back to the grid to regulate power demand or assist with power demand at times when demand exceeds supply.

Early conclusions of these investigations are that electric vehicles can become an important resource for the California electric utility system, and that their use would provide system reliability, economic and emissions benefits. The economic value of these benefits show the potential to offset the initially higher costs of electric vehicles and may make the net cost of purchasing and operating EVs lower than that of gasoline vehicles. Early indications are that the cost of electricity from EVs is too high to be competitive for base-load power, but that EVs may prove to be competitive in three other markets: peak power, spinning reserves, and grid regulation.

Where do EVs charge?

Most EVs are charged at home or at the work-site for fleets. When a consumer purchases or leases an EV, they also typically install a charger in their garage or carport for convenient home recharging. This makes nightly recharging very convenient and means that EV drivers start every day with a full charge.

For More Information

Please contact the ARB toll-free at (800) END-SMOG/(800) 363-7664 (California only) or (800) 242-4450. More information on the Zero Emission Vehicle Program is available on ARB's web site at www.zevinfo.com or at www.arb.ca.gov/msprog/zevprog/zevprog.htm. You may obtain this document in an alternative format by contacting ARB's ADA Coordinator at (916) 322-4505 (voice); (916) 324-9531 (TDD, Sacramento area only); or (800) 700-8326 (TDD, outside Sacramento).